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BOOKS RECEIVED.

ANIMAL LIFE AS AFFECTED BY THE NATURAL CONDITIONS OF EXISTENCE, by KARL SEMPER, Professor of the University of Würzburg. With two maps and one hundred and six wood cuts. D. Appleton & Co., New York, 1881.

Naturalists have been more than once taunted with too much philosophizing over the Darwinian theory, that they were content to form fanciful ideas as to how this or that difficulty could be hypothetically explained, and that fundamental causes—equally fanciful—were imagined to account for results which were actually observed.

We apprehend that if the Darwinian theory is to become a scientific dogma, the future course of naturalists must lie in the direction of applying the test of exact investigation to the hypotheses already laid down. The task is doubtless a laborious one, and Professor Semper himself says that to prove by experiment the truth of many of these hypotheses long and deep researches are indispensable, or the student will find himself wrecked upon insurmountable difficulties.

There are a number of eminent naturalists whose works tend in this direction, and Professor Semper now leads the van of those who would systematically apply themselves to this task.

Considering that Variability is one of the properties of the animal kingdom which might be most easily traced by exact investigation to its efficient causes, Professor Semper has made it the subject matter of his book, and to facilitate the task of himself and others, has presented a general view of those facts and hypotheses which bear upon the subject, and which are either of universal significance or appear to offer favorable subjects for experimental treatment.

It is not claimed that this work is a complete review of even this branch of the enquiry, but it lays out a plan fortified by a long array of facts, showing how the enquiry may be systematically conducted. It is thus a protest against casual and disconnected observation, and as such may be read with profit by every student.

The introductory chapters are of much interest, dealing with some of the salient points of the Darwinian theory. The plan of the work is also explained and the reader introduced to the subject.

The main body of the book is divided into two sections. The first treats of the influence of *inanimate* surroundings, and in this division Professor Semper directs attention to the influence of food, light, and temperature upon organisms. The results attributable to water, both still, and in motion, are explained, and finally other influences are considered.

In the concluding portion of this work, the influence of *living* surroundings is discussed in such a masterly manner, as to be of the highest service to those studying this subject.

We notice that the subject of the geographical distribution of animals is discussed by Professor Semper, who points out the chief difficulties in bringing into accord the various hypotheses, suggested to explain the undoubted fact that certain species overstep the limits apparently assigned to them by Nature.

Whenever any extensive resemblance between the faunas of two distinct countries is discovered or imagined, a hypothetical history of upheavals and subsidences is suggested, to form a bridge of mainland, as a mode of accounting for this resemblance. This appears to be a favorite theory of Mr. Wallace, and Professor Semper himself admits that such must have been the case in some instances, as he himself found an Indian elephant on Mindanao, the most southerly of the Philippines, for such an animal could scarcely have made the passage by sea. Nevertheless, Professor Semper considers these hypothetical connections of the islands and

mainland as not sufficient by themselves to explain even those facts which are already known, as to the distribution of Indian and Australian forms on the islands lying between the two continents.

He further states that "until the question is finally settled whether two parallel series of animal development might not have proceeded independently in two countries remote from each other, we can never venture to regard the resemblance of two faunas as conclusive evidence of their primæval actual connection; nay, it even seems to me that the two historical series of species of the horse, recently discovered both in Europe and America, may, on the contrary, be regarded almost as a proof that each series was developed independently on the two continents, and yet led to the same result: namely, the production of the horse."

Leaving this, however, as an open question, Professor Semper advances a theory for accounting generally for irregularities in the geographical distribution of animals, by suggesting that the action of currents and winds co-operated in a large degree in producing the results which are found to exist.

As a means of distributing animal life it is evident that winds and currents conveyed certain animals from place to place, but Professor Semper points out that these influences frequently acted as a hindrance to the distribution of species. Every navigator is familiar with the fact that currents have a dividing power, shown by the tendency of objects to drift to the edge of the stream, although they may have fallen into the middle of it. This tendency of the current to clear itself—or clean itself—is stronger in proportion to its rapidity and strength. Hence, objects torn by a stream flowing between two islands from the one lying to the left of it, could be borne to that on the right side only under specially favoring circumstances; and *vice versa*, those brought from the right could never, or very rarely, be carried to the opposite side. Thus a mixture of the faunas of the two islands might be hindered, simply by the action of the current flowing between them, except in the case of free swimming animals having the power to overcome the mechanical resistance of the current. In considering the striking circumstance that the islands lying close to Africa have quite a different fauna from that of the neighboring continent, this influence is mentioned as a factor.

Between these theories, offered respectively by Mr. Wallace and Professor Semper, no positive conclusions can be drawn, for want of sufficient evidence based on general conclusions, and while neither can be rejected as erroneous, both must remain open for future discussion. Professor Semper, however, claims one advantage that his hypothesis appeals for proof only to such elements as can be brought under direct observation, while that of Mr. Wallace is intrinsically incapable of demonstration by observation.

The work concludes with sixty pages of closely-printed notes, containing much useful information, and a long array of facts bearing on the subject matter of the work.

We have probably shown by this review that Professor Semper has presented a work of the highest value to every naturalist, and we can assure the general reader that he will find in it material that will engross his attention, and cause him to regret the moment when he arrives at the last pages.

ERRATUM.

Mr. Dopp desires to make the following correction in his paper in the last issue:

"In my article on page 200 of "SCIENCE," the expression $\lambda = \frac{v}{n}$ and $\lambda' = \frac{v}{n'}$ should have been $\lambda = \frac{V}{n}$ and $\lambda' = \frac{V}{n'}$ V being the velocity of light.